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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/997,696	11/30/2001	Anthony Charles Bach	18872.0004	4744

7590

08/22/2003

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EXAMINER

LEURIG, SHARLENE L

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 08/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/997,696

Applicant(s)

BACH ET AL.

Examiner

Sharlene Leurig

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 17-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-10 and 12-16 is/are rejected.
- 7) ☒ Claim(s) 5, 9, 11, 12 and 14 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election without traverse of claims 1-16 in Paper No. 6 is acknowledged.

### ***Priority***

2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in the United Kingdom on December 1, 2000. It is noted, however, that applicant has not filed a certified copy of the British application as required by 35 U.S.C. 119(b).

### ***Examiner's Notes***

3. The spelling of the word "principal" in claim 5 should be changed to "principle".

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 9, 12 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
6. The term "disc-like" in claim 9 is a relative term which renders the claim indefinite. The term "disc-like" is not defined by the claim, the specification does not

provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. For the purposes of examination, the term "disc-like arrays" will be interpreted as meaning "disc-shaped arrays".

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-4 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Ito et al. (JP 63-078448A).

Regarding claim 1, Ito discloses a photomultiplier comprising a plurality of dynode trains comprising multiple dynodes (Figure 1, elements 15a-15d) arranged in cascade so that the second and any subsequent dynodes each receive electrons from the preceding dynode, as denoted by the arrows connecting the individual dynodes of dynode train 15c. The dynodes are of curvilinear cross-section and arcuate in extent about a common axis, that common axis being the center axis of the photomultiplier, around which all four dynode trains are symmetrically arranged. The successive dynodes are disposed so that the cascade extends radially relative to the center axis.

Regarding claim 2, the successive dynodes of each dynode train are disposed successively outwardly of each other relative to the center axis, as can be seen in the

dynode train 15c, where each dynode is slightly farther toward the outside of the photomultiplier tube than the preceding dynode.

Regarding claim 3, the curvilinear cross-section of the dynodes comprises a part-elliptical portion, as each dynode is curved in the shape of a partial ellipse.

Regarding claim 4, the dynodes are part-annular, being curved as a ring is curved.

Regarding claim 10, alternate dynodes in each dynode train are spaced apart from each other successively along the center axis, each dynode being across from the next in a direction transverse to the center axis, as shown by the dynodes of dynode 15c in Figure 1.

9. Claims 1, 6-8 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Okano et al. (5,633,562).

Okano discloses a photomultiplier comprising a plurality of dynodes (Figure 6, elements 61,62,67,68,69) arranged in cascade so that the second and any subsequent dynodes each receive electrons from the preceding dynode (column 4, lines 32-37). The dynodes are of curvilinear cross-section and arcuate in extent about a common axis, that common axis being the center axis of the photomultiplier, around which all the dynodes are arranged. The successive dynodes are disposed so that the cascade extends radially relative to the center axis.

Regarding claim 6, the effective area of dynode 69 is greater than the effective area of the preceding one, dynode 68.

Regarding claim 7, the effective area of dynode 68 is less than the effective area of the preceding one, dynode 67.

Regarding claim 8, if the change in effective area of dynodes 67 and 68 is a value x and the change in effective area of dynodes 68 and 69 is a value y, then the change of effective area from dynode to dynode is linear when the graphed differences are examined individually, "from dynode to dynode".

Regarding claim 10, alternate dynodes are spaced apart from each other successively along the center axis, each dynode being across from the next in a direction transverse to the center axis.

### ***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (JP 63-078448 A) in view of Kimura et al. (4,937,506).

Ito discloses a photomultiplier comprising a plurality of dynodes, as discussed above, and further discloses an anode that receives electrons from the last dynode (Figure 1, elements P1-P4).

Ito lacks disclosure of the structure of the claimed anode.

Kimura teaches a segmented anode (Figure 6B, element 4) as part of a photomultiplier tube capable of improved precision in position detection (column 1, lines 6-9).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ito's anode to be segmented, as taught by Kimura, in order to provide a photomultiplier with improved position detection, as taught by Kimura.

Regarding claim 15, Ito discloses an anode support that is thin, where thin is interpreted as being less than the width of the photomultiplier tube. The claim limitation of reducing anode capacitance is intended use and therefore is not given patentable weight.

12. Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okano et al. (5,633,562) in view of Kimura et al. (4,937,506).

Okano discloses a photomultiplier comprising a plurality of dynodes, as discussed above, and further discloses an anode that receives electrons from the last dynode (Figure 6, element 7).

Okano lacks disclosure of the structure of the claimed anode.

Kimura teaches a segmented anode (Figure 6B, element 4) as part of a photomultiplier tube capable of improved precision in position detection (column 1, lines 6-9).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Okano's anode to be segmented, as taught by Kimura, in order to provide a photomultiplier with improved position detection, as taught by Kimura.

Regarding claim 15, Okano discloses an anode support that is thin, where thin is interpreted as being less than the width of the photomultiplier tube. The claim limitation of reducing anode capacitance is intended use and therefore is not given patentable weight.

13. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (JP 63-078448 A) in view of Beetz, Jr. et al. (6,384,519).

Ito discloses a photomultiplier comprising a plurality of dynodes in an effort to make the photomultiplier tube smaller in size, but lacks explicit disclosure of the material forming the dynodes.

Beetz, Jr. teaches a compact photomultiplier achieved by dynodes (Figure 2, elements 36a-d) that are formed of layers of a secondary emissive material (52) deposited on shaped surfaces of a common substrate of insulating material (column 10, lines 15-17). The dynodes are individual holes formed in a common layer (36), the amplification properties being achieved by deposition of an emissive layer inside the hole.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Ito's dynodes to be formed of emissive material deposited on shaped insulating material in order to provide a compact photomultiplier, as taught by Beetz, Jr.

***Allowable Subject Matter***



14. Claims 5 and 11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for indicating allowability:

The Examiner notes that the Prior Art of Record, Ito et al. (JP 63-078448 A) and Okano et al. (5,633,562), disclose photomultipliers having multiple dynodes of curvilinear cross-section and part-annular shape formed in a cascade that extends radially to a common axis, that being the central axis of the photomultiplier tube.

Regarding claim 5, the references of the prior art of record fail to teach or suggest the combination of limitations as set forth in claim 5, and specifically comprising the limitation of the part-annular dynodes that are disposed to form a cascade that moves radially to the axis of the tube having curvilinear cross-sections that are sections through a set of toroidal surfaces having a common principle axis of rotation, each dynode intersected by a coaxial conical surface.

Regarding claim 11, the references of the prior art of record fail to teach or suggest the combination of limitations as set forth in claim 11, and specifically comprising the limitation of the curvilinear dynodes that are disposed to form a cascade that moves radially to the axis of the tube also being alternately disposed on male and female conical surfaces.

15. Claims 9, 12 and 14 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Regarding claims 9, 12 and 14, the references of the prior art of record fail to teach or suggest the combination of limitations as set forth in claim 9, and specifically comprising the limitation of the curvilinear dynodes that are disposed to form a cascade that moves radially to the axis of the tube also being arranged in two coaxial, planar disc-shaped arrays.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharlene Leurig whose telephone number is (703)305-4745. The examiner can normally be reached on Monday through Friday, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (703)305-4794. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7382 for regular communications and (703)308-7382 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

*Joseph Williams*  
*Joseph Williams*

Sharlene Leurig  
August 14, 2003

*SL*